



NMR&D News

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CAREN: Using Virtual Reality in Rehabilitation and Research

By LT Jamie Bartlett
NHRC Warfighter Performance Dept.

The term virtual reality (VR) conjures up character images from science fiction movies, escaping the world around them and embarking on something of fantasy. Today's technology allows researchers and medical providers to utilize VR to immerse an individual into a simulated scenario to achieve rehabilitation goals and evaluate human performance in a realistic but safe laboratory setting. In the research setting, immersion

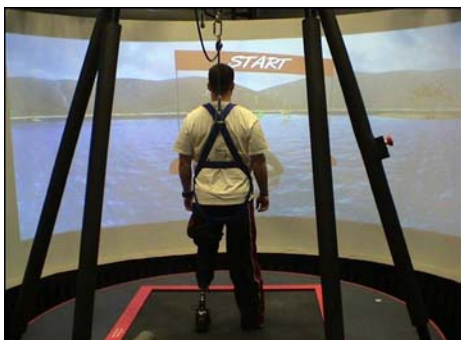
provides the link from sterile laboratory testing to "real world" applications. The Human Performance Lab at the Naval Health Research Center (NHRC) recently finished the installation of a Computer Assisted Rehabilitation Environment (CAREN). NHRC's CAREN is the seventh in the world and third in the United States; these three all reside at Department of Defense (DoD) facilities. The other CAREN facilities are located at the Walter Reed Army Medical Center's Military Amputee Training Center and the Brooke Army Medical Center's Center for the Intrepid. The Army facilities primarily utilize the CAREN as a clinical rehabilitation tool.

The CAREN works in real-time, enabling the creation of different experiments in controlled and repeatable environments by using different VR principles. These principles provide a unique reactive virtual experience for the user, including visual, auditory, vestibular and tactile sensory inputs.

The system consists of a nine-foot diameter platform on six hydraulic actuators that can be programmed to move in any direction (yaw, pitch and roll up to 25 degrees) independently or simultaneously. A split belt treadmill runs the length of the platform with an independent integrated force plate under each belt. Body movements are acquired by a 10-camera motion capture system. The system is surrounded by an 8-foot tall, 180-degree screen whose images are synchronized with movement of the platform and input from the user.

The CAREN is much like a flight simulator, but instead of flying a plane, the individual physically navigates his or her body through a virtual world.

NHRC will conduct research and advanced development work with the CAREN system in several ways. One key area will involve accelerated rehabilitation research and research on the effectiveness of various prosthetics. *Continued on page 2*



Regional Severe Acute Respiratory Infection (SARI) Workshop

By Ms. Sharon Daves
Deputy Director, Global Disease
Detection Response Program

The Global Disease Detection and Response Program (GDDRP) at the U.S. Naval Medical Research Unit No. 3 (NAMRU-3) organized and hosted the first Regional Severe Acute Respiratory Infection (SARI) Workshop in Luxor, Egypt, December 14-16, 2009. The U.S. Centers for Disease Control and Prevention (CDC) sponsored the workshop, which included 48 participants from NAMRU-3, CDC, the ministries of health in Egypt, Jordan, Oman, Qatar and Yemen, and representatives from Cairo University Hospital and Ain Shams University Hospital.

NAMRU-3 and CDC subject matter

experts developed an agenda composed of topics ranging from the global pandemic H1N1 (pH1N1) situation to data management of the regional SARI network to laboratory diagnostics related to pH1N1 and SARI. Participants received information related to monitoring and evaluation of surveillance systems, various uses of SARI laboratory specimens to detect other diseases, use of SARI data to determine the burden of disease, and how to integrate seasonal influenza and influenza-like illness (ILI) surveillance systems.

The workshop provided a forum for all participants to share and discuss challenges related to their efforts to collect and analyze data. These discussions provided the first-ever oppor-

tunity for the representatives of these countries to meet and understand the similarities and differences among their respective systems that make up the regional network.

During the workshop, data was presented that brought change to the regional network. The SARI case definition was examined and regional representatives expressed a desire to expand the inclusion criteria to add pneumonia cases; this discussion led to expanded inclusion criteria and a change in the data collection forms. The representatives found the workshop worthwhile and as a result, requested a quarterly regional newsletter be developed and distributed throughout the regional network and the regional workshop be held each year.

Commanding Officer's Message

Researchers, Support Staff and Stakeholders of Navy Medical Research, Development, Testing and Evaluation (NMRDT&E):

If you are looking for biomedical research relevant to the Navy and Marine Corps, look no further. This issue of our newsletter highlights cutting-edge research as well as the worldwide influence of Navy Medical Research and Development, from virtual reality rehabilitation research with one of seven computer design clinical rehabilitation tools in the world to a recent article in the *New England Journal of Medicine* that notes a strong relationship between the early use of morphine for pain management and a possible reduction in post-traumatic stress disorder symptoms. Navy biomedical researchers are also looking at clinical issues associated with mechanisms of heterotopic ossification. Navy researchers at NMRC in Peru are testing the clinical efficacy and safety of a new anti-leishmaniasis treatment for simple and uncomplicated cutaneous leishmaniasis. NAMRU-3 Cairo continues to lead the region in Africa and Southwest Asia on topics of infectious disease importance including pandemic H1N1, seasonal flu and infectious disease diagnostics.

Lastly, I am proud to announce our Clinical Investigation lecture series in Benkhe Auditorium, building 503 at NMRC/WRAIR. The ten presentations feature distinguished speakers from the FDA, pharmaceutical industry, a research volunteer advocacy group, NMRC and WRAIR. Our inaugural guest lecturer was Dr. Douglas Throckmorton, Deputy Director, FDA's Center for Drug Evaluation and Research (CDER), whose topic was "Drug Development and the FDA: Lessons from the Past, Prospects for the Future." The seminar was an overwhelming success, with over 150 persons from various Navy and Army commands and organizations attending. Human Research Protection Training credit is being offered to attendees. Upcoming lectures include:

- February 25 at 10:00 a.m. - Dr. Karen Midthun, Acting Director, FDA Center for Biologics Evaluation and Research
- March 11 at 9:00 a.m. - Mr. Joseph Griffin, Regulatory Counsel, Office of Medical Policy, CDER
- April 2 at 9:00 a.m. - Dr. Robert Temple, Director, Office of Medical Policy, CDER

Commanding Officer sends,
Richard L. Haberberger, Jr.
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CAREN

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These studies will be conducted with the other two DoD facilities.

Another area involves studies examining physical and cognitive performance under high combat load conditions. Studies are needed to determine the extent of these decrements and identify ways of mitigating or minimizing the deficits.

The CAREN platform may be useful in identifying subtle forms of traumatic brain injury (TBI) through careful analyses of gait and/or electroencephalograph data. Ironically, most of what is understood about the brain and its subsystems has been derived from

humans in seated or supine positions via electroencephalograph (EEG) and functional magnetic resonance imaging recordings. In collaborative work with the University of California - San Diego, it may soon be possible for EEG to be accurately recorded in a person walking through a virtual space like the CAREN system, providing a more precise way of studying brain system asynchronies due to TBI or other insults.

Virtual environments have been very successful and well received by patients in the military rehabilitation setting. As a rehabilitation tool, virtual environments are extremely motivating for service members who have grown up in an age of video games and high

graphic computer technology. In the NHRC Warfighter Performance Department, we intend to move beyond the rehabilitation setting and utilize the virtual environment capability to bridge the gap between the experimentally controlled but unrealistic laboratory setting and the confounds and safety issues that occur directly in the field.



NHRC Links Morphine's Ability to Reduce PTSD in Injured

A study of nearly 700 troops conducted by scientists in the Naval Health Research Center (NHRC) Department of Medical Modeling and Simulation indicated service members given morphine soon after sustaining an injury are half as likely to develop post-traumatic stress disorder (PTSD). The study was described in the article "Morphine Use after Combat Injury in Iraq and Post-Traumatic Stress Disorder," published in the January 14, 2010 issue of the New England Journal of Medicine.

NHRC researchers used data from the Expeditionary Medical Encounter Database (EMED), a comprehensive clinical dataset that includes records of casualties who were sick or injured during deployment, tactical information regarding the circumstances that generated the injury or illness, and long-term follow-up data on the clinical, re-

habilitative and psychosocial outcomes of the injury or illness. The study included 696 injured U.S. service members without serious traumatic brain injury and with complete medication data identified from EMED. Injured military personnel (some of whom later developed PTSD and some of whom did not) were identified from military personnel presenting to forward medical treatment facilities (MTFs) for acute injuries during the major combat and support phases of Operation Iraqi Freedom, defined as the 36-month period from January 2004 to December 2006. PTSD diagnosis was obtained by review of casualty medical records. The resulting data indicated the use of morphine directly after injury, during resuscitation and early trauma care, was associated with a nearly 50 percent reduction in the risk of developing PTSD. This association remained sig-

nificant and independent after adjustment for injury severity.

The study is the first to connect administration of morphine after injury with a reduced risk of PTSD in injured military personnel. The data suggests that the use of morphine after serious injury may be a first-line defense against the development of PTSD. Researchers speculated that reducing pain may also reduce psychological trauma by causing the brain to form less traumatic memories of the injury. Furthermore, the effect of morphine observed in this study may not be specific to morphine and is likely to be observed with other, related opiates. Further research is crucial to understanding the potential impact and importance of morphine use after injury and PTSD risk reduction in the future. *Article compiled from Navy public affairs documents.*

NMRCD Begins Clinical Trial of New Leishmaniasis Treatment

By LT Jeremy Westcott
NMRCD Administrative Officer

The Universidad Peruana Cayetano Heredia and the U.S. Naval Medical Research Center Detachment (NMRCD), Peru started a Phase II clinical trial to test the pharmacokinetics, efficacy and safety of a topical cream developed at the Walter Reed Army Institute of Research (WRAIR) as a treatment for simple and uncomplicated cutaneous leishmaniasis. The trial is a pharmacokinetic study sponsored by the U.S. Army Medical Materiel Development Activity (USAMMDA) and will be conducted in Lima, Peru for approximately 12 months. The study will compare the activity of paromomycin plus gentamicin versus paromomycin alone

for the treatment of cutaneous leishmaniasis and will measure the pharmacokinetics of paromomycin and gentamicin in the blood after application of the cream to a patient's lesions. The first three patients were enrolled in January 2010. This trial complements a larger Phase III study currently underway in Tunisia that is also sponsored by USAMMDA. If proven safe and effective, this topical treatment will provide a potentially shorter and more benign alternative for the treatment of leishmaniasis, a disfiguring and highly burdensome disease that affects military and civilian populations in many regions of South Asia, the Middle East (including both Iraq and Afghanistan), North Africa and Latin America.

Pictured from left to right: Ms. Melissa Askin, USAMMDA; LTC Karen M. Kopydlowski, USAMMDA; COL Max Grogl, WRAIR; CDR John W. Sanders, NMRCD; LT Paul C. Graf, NMRCD; Dr. Maxy de los Santos, NMRCD; Dr. Andres G. Lescano, NMRCD; Mr. Jorge Nuñez, NMRCD; Ms. Carmen Lucas, NMRCD



NMRC Studies Mechanism of Heterotopic Ossification Formation

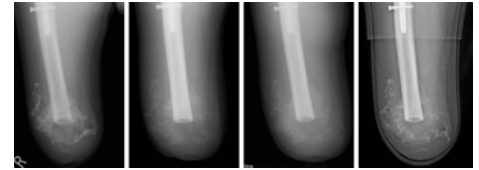
By Dr. Doug Tadaki
Dept. Head, Regenerative Medicine

Massive soft tissue and bone deficits are a significant concern in the care of combat casualties, and orthopedic injuries in particular. Clinicians caring for combat casualties at the National Naval Medical Center (NNMC) and the Walter Reed Army Medical Center (WRAMC) identified an emergent clinical issue of heterotopic ossification (HO), which is the formation of bone in the soft tissues.

Two retrospective clinical studies conducted by WRAMC and NNMC/NMRC staff revealed nearly identical HO incidence rates of 60 percent in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) casualties with extremity injuries compared to 15 percent for similar civilian injuries. Following this finding,

scientists within NMRC's Regenerative Medicine Department became interested in the mechanisms of HO formation. The laboratory has been studying the mechanism of bone formation from bone marrow derived mesenchymal stem cells (MSC) as part of an In-House Laboratory Independent Research (ILIR) project. MSCs are adult stem cells found in multiple tissues with the ability to differentiate into bone, cartilage, fat and muscle; controlling the development of MSCs could provide an avenue to treat battlefield injuries.

Scientists within the Regenerative Medicine Department applied the knowledge and techniques developed in the ILIR project to the study of heterotopic ossification. The experiments showed effluent (fluid) from wounds of OIF/OEF casualties who developed HO contains factor(s)



that exponentially promotes the osteogenic differentiation of mesenchymal stem cells in culture. Genetic and molecular analysis revealed specific osteogenic factors such as bone morphogenic proteins as well as a bone-specific collagen were upregulated in these wounds. This work demonstrated a direct application of tools developed to answer a basic science question to an emergent clinical issue. This research paves the way to identify these factors and to develop treatments to reduce the incidence or prevent the occurrence of heterotopic ossifications in military personnel injured in war.

Greetings from the NMRC Ombudsman!

I hope everyone is having a successful start to 2010. With the New Year here, this is a time when many of us reflect upon our lives and make New Year's resolutions. These resolutions can range from considering a career change, learning a new language, or perhaps this is the year that you have vowed to become financially savvy. The great thing about making a resolution is you can take the time to evaluate your life and pinpoint the things you want to change.

Tax Time

Yes, it's that time of year again. For many of us, it can be a very daunting task to file taxes when dealing with so many issues such as federal and state taxes, making sure you get your maximum refund, or worrying about filing when your sailor is deployed. MilitaryOneSource is helping to take out the guesswork by providing free online tax filing services to all active duty, National Guard, and Reserve Service Members and their families. Tax consultants will be available seven days a week from 7 a.m. – 11 p.m. Eastern Time to help guide you through the process. Please check out this

website and take advantage of this wonderful service.

<http://www.militaryonesource.com/MOS/FindInformation/Category/TaxFilingServices.aspx>.

If your spouse is deployed to the Iraq or Afghanistan theater of operations, be sure to let your tax filing service know since you may be entitled to additional deductions and entitlements.

Happy Valentine's Day

With Valentine's Day approaching, we should all take advantage of MilitaryOneSource's new online video site, TroopTube, to help us stay connected with our deployed Sailors. The site is designed for easy use so you can quickly upload videos and share the simple joys of each day with each other. Sign up today and begin sharing videos. Go to:

<http://www.trooptube.tv/home>

If you need more information on these or any other resources, please feel free to contact me at angela.prouty@med.navy.mil or 217-722-4981.

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